A Five-Element Quad Antenna for 2 Meters

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If your station is located on the fringe of the repeater's coverage area, you've come to the right place. Why not build a 5-element quad antenna? It may be just what you need to get you into the action! But the big question is: Would you build one for 2 meters or 40 meters? I chose 2-meter band work because, as you can see from the photograph, this antenna uses wood for the boom and dowels for the wire spreaders. It's oriented in the classic diamond configuration.

I made sure that building this antenna would be simple. In so doing, I practically guaranteed that I'd be able to complete the project! (I'm the last person that should be building an antenna. I'm typically "all thumbs" when it comes to construction practices.) The antenna's forward gain is at least 11 dBi. The SWR is 2:1 or better throughout most of the 2-meter band. To accomplish this goal, the quad antenna is designed to deliver every dB you can to the antenna. A forward gain of at least 11 dBi, an SWR of 2:1 or better, and the minimal size of the antenna are all important features of this antenna design.

I chose low cost and simple construction as the main design goals. As a result, I ended up with an effective antenna that has the following features:

- A forward gain of at least 11 dBi
- An SWR of 2:1 or better throughout most of the 2-meter band
- A minimal size
- Low cost and simple construction

I ordered all the necessary materials from a woodcraft supplier and the local radio store. Since I wanted to use it for FM and repeater work, I chose horizontal polarization. Attaching the feed to the upper corner for horizontal polarization (Figure 4) is a popular choice since it allows the maximum length of the driven element to be used. If you want vertical polarization (Figure 3), or attach the transmission line to the bottom corner for horizontal polarization (Figure 4). I opted for vertical polarization since I wanted to use it for FM and repeater work. If you want to try your hand at SSB and CW work, choose horizontal polarization. Attaching the feed to the upper corner for horizontal polarization is a popular choice since it allows the maximum length of the driven element to be used.

Construction

Before beginning construction, you must first determine the physical dimensions of each of the antenna's elements. The five elements of this quad antenna are:

- Five director elements
- One reflector element

Table 1

<table>
<thead>
<tr>
<th>Element</th>
<th>Length</th>
<th>Typical Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Director 1</td>
<td>76.5 inches</td>
<td>$3.06</td>
</tr>
<tr>
<td>Director 2</td>
<td>80 inches</td>
<td>$1.99</td>
</tr>
<tr>
<td>Director 3</td>
<td>84.5 inches</td>
<td>$3.97</td>
</tr>
<tr>
<td>Director 4</td>
<td>88 inches</td>
<td>$2.99</td>
</tr>
<tr>
<td>Director 5</td>
<td>91.5 inches</td>
<td>$4.99</td>
</tr>
<tr>
<td>Reflector</td>
<td>107 inches</td>
<td>$4.99</td>
</tr>
</tbody>
</table>

The lengths of the second and third director elements are determined by following a 3% series. In other words, the length of the second director is approximately 3% less than the first director, and the length of the third director is about 3% less than the second director. The equations given in the text and table above are as follows:

- Director 1 length = 107 inches / 1.03
- Director 2 length = Director 1 length / 1.03
- Director 3 length = Director 2 length / 1.03
- Director 4 length = Director 3 length / 1.03
- Director 5 length = Director 4 length / 1.03
- Reflector length = 107 inches / f0

where f0 = Center frequency (in MHz)

= LDirector1

= LDirector2

= LDirector3

= LDirector4

= LDirector5

= LReflector

The lengths of the second and third director elements can be computed using the following formulas:

- Second director length = 107 inches / f0
- Third director length = 107 inches / (f0 * 1.03)

As you can see from the photograph, the antenna uses wood for the boom and dowels for the wire spreaders. It's oriented in the classic diamond configuration. The boom is 20 feet long. The reflector extension is 3 feet long. The director arms are 10 feet long and the transmission line is 14 feet long.

I trimmed the length of the 1/4-inch plywood spreader arms so that they would have a 31.25-inch length. Each element requires two spreader arms to form the cross-arm. Carefully notched the ends of the spreader arms. These notches will be used to secure the wire elements.

That completes the construction of the main antenna structure. Now, carefully measure and cut the wire used for each of the five elements. Mount the boom to the remaining 2-foot length of 2×2. I used a simple butt-end joint reinforced by a small 1-inch long wood pin fashioned from a piece of doweling. The boom is a Yagi type antenna with a Yagi gain of approximately 21.5 dBi. The Yagi gain is the result of the use of a backward-facing dipole with a forward-facing dipole. The Yagi gain is the result of the use of a backward-facing dipole with a forward-facing dipole.

The Yagi gain is the result of the use of a backward-facing dipole with a forward-facing dipole.

I decided whether to use horizontal or vertical polarization. The feedpoint of the driven element determines the polarization. Use corner feed on the side if you decide to use horizontal polarization. Feed the bottom corner of the driven element for horizontal polarization. If you want vertical polarization, feed the element from the top corner. To do this, mount the 1/4-inch plywood spreader arms so that they are at a 45-degree angle from the boom. Mount the boom to the remaining 2-foot length of 2×2. I used a simple butt-end joint reinforced by a small 1-inch long wood pin fashioned from a piece of doweling. The boom is a Yagi type antenna with a Yagi gain of approximately 21.5 dBi. The Yagi gain is the result of the use of a backward-facing dipole with a forward-facing dipole. The Yagi gain is the result of the use of a backward-facing dipole with a forward-facing dipole.

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